WHAT IS CLAIMED IS:

1. A method of inhibiting metastasis of a tumor cell in a mammal, wherein the tumor cell expresses CXC Chemokine Receptor-4 (CXCR4), which method comprises administering to the mammal in an amount sufficient to inhibit metastasis of the tumor cell a polypeptide of the formula:

Xaa_1-Xaa_2-Xaa_3Cys_4-Xaa_5-Xaa_6-Xaa_7-Cys_8-Xaa_9-Xaa_{10}-Gly_{11}-Xaa_{12}-Cys_{13}-Xaa_{14}-Xaa_{15}-Xaa_{16}-Cys_{17}-Xaa_{18}-Xaa_{19}-R

(SEQ ID NO: 1)

wherein, each of Xaa_1, Xaa_2, and Xaa_{19} is optionally a part of the polypeptide,
wherein, when Xaa_1 is a part of the polypeptide, Xaa_2 is part of the polypeptide,
wherein each of Xaa_3, Xaa_5, Xaa_9, Xaa_{12}, and Xaa_{14} is an amino acid selected from the group consisting of Tyr, Phe, and Trp,
wherein each of Xaa_1, Xaa_2, Xaa_6, Xaa_7, Xaa_{10}, Xaa_{15}, Xaa_{16}, Xaa_{18}, and Xaa_{19} is an amino acid selected from the group consisting of Arg and Lys,
wherein R is –OH or -NH_2,
wherein Cys_4 is optionally disulfide bonded to Cys_{17}, and
wherein Cys_8 is optionally disulfide bonded to Cys_{13}.

2. The method of claim 1, wherein the polypeptide is T22:

Arg-Arg Trp-Cys-Tyr-Arg-Lys-Cys-Tyr-Lys-Gly-Tyr-Cys-Tyr-Arg-Lys-Cys-Arg

(T22; SEQ ID NO: 2).

3. The method of claim 1, wherein the tumor cell can metastasize to an organ and the organ comprises cells expressing Stromal Derived Factor-1 (SDF-1).

4. The method of claim 3, wherein the organ is the skin, liver, or brain.

5. The method of claim 3, wherein the organ is the lung.

6. The method of claim 1, wherein the tumor cell is a breast cancer cell, a breast tumor cell, a lymphoma cell, a neuroblastoma cell, a lung cancer cell, an angiosarcoma cell, a pancreatic cancer cell, a leukemia cell, or a prostate cancer cell.

7. The method of claim 1, wherein the tumor cell is a melanoma cell.

8. The method of claim 7, wherein the polypeptide is administered to the mammal intraperitoneally.

9. The method of claim 1, wherein the polypeptide is administered to the mammal daily.

10. The method of claim 9, wherein the polypeptide is administered to the mammal daily for at least 2 days.

11. A method of inhibiting metastasis of a tumor cell in a mammal, wherein the tumor cell expresses a CXCR4, which method comprises administering to the mammal in an amount sufficient to inhibit metastasis of the tumor cell an antagonist of CXCR4, wherein the antagonist of CXCR4 is not an antibody that binds to CXCR4.

12. A method of inhibiting metastasis of a tumor cell in a mammal, wherein the tumor cell expresses CXCR4, which method comprises administering to the mammal in an amount sufficient to inhibit metastasis of the tumor cell an antagonist of β_1 integrin.

13. The method of claim 12, wherein the antagonist of β_1 integrin is an antibody that binds to β_1 integrin.

14. The method of claim 13, wherein the antibody that binds to β_1 integrin is a blocking antibody.

15. The method of claim 12, wherein the tumor cell is a breast cancer cell, a breast tumor cell, a lymphoma cell, a neuroblastoma cell, a lung cancer cell, an angiosarcoma cell, a pancreatic cancer cell, a leukemia cell, or a prostate cancer cell.

16. The method of claim 12, wherein the tumor cell is a melanoma cell.

17. The method of claim 12, wherein the metastasis is metastasis to the skin, liver, or brain.

18. The method of claim 12, wherein the metastasis is metastasis to the lung.

19. The method of claim 12, wherein the mammal is a human.

20. A method of inhibiting metastasis of a tumor cell in a mammal, wherein the tumor cell expresses CXCR4, which method comprises administering to the mammal in an amount sufficient to inhibit metastasis of the tumor cell an antagonist of CXCL12.

21. The method of claim 20, wherein the antagonist of CXCL12 is an antibody that binds to CXCL12.

22. The method of claim 21, wherein the antibody that binds to CXCL12 is a blocking antibody.

23. The method of claim 20, wherein the tumor cell is a breast cancer cell, a breast tumor cell, a lymphoma cell, a neuroblastoma cell, a lung cancer cell, an angiosarcoma cell, a pancreatic cancer cell, a leukemia cell, or a prostate cancer cell.

24. The method of claim 20, wherein the tumor cell is a melanoma cell.

25. The method of claim 20, wherein the metastasis is metastasis to the skin, liver, or brain.

26. The method of claim 20, wherein the metastasis is metastasis to the lung.

27. The method of claim 20, wherein the mammal is a human.

28. A method of inhibiting metastasis of a tumor cell in a mammal, wherein the tumor cell expresses CXCR4, which method comprises administering to the mammal in an amount sufficient to inhibit metastasis of the tumor cell an antagonist of α_4 integrin.

29. The method of claim 28, wherein the antagonist of α_4 integrin is an antibody that binds to α_4 integrin.

30. The method of claim 29, wherein the antibody that binds to α_4 integrin is a blocking antibody.

31. The method of claim 28, wherein the tumor cell is a breast cancer cell, a breast tumor cell, a lymphoma cell, a neuroblastoma cell, a lung cancer cell, an angiosarcoma cell, a pancreatic cancer cell, a leukemia cell, or a prostate cancer cell.

32. The method of claim 28, wherein the tumor cell is a melanoma cell.

33. The method of claim 28, wherein the metastasis is metastasis to the skin, liver, or brain.

34. The method of claim 28, wherein the organ is the lung.

35. The method of claim 28, wherein the mammal is a human.

36. A method of inhibiting growth of a tumor cell, wherein the tumor cell expresses CXCR4 and the growth is stimulated by SDF-1, which method comprises administering to the tumor cell in an amount sufficient to inhibit the growth of the tumor cell a polypeptide of the formula:

Xaa_1-Xaa_2-Xaa_3Cys_4-Xaa_5-Xaa_6-Xaa_7-Cys_8-Xaa_9-Xaa_{10}-Gly_{11}-Xaa_{12}-Cys_{13}-Xaa_{14}-Xaa_{15}-Xaa_{16}-Cys_{17}-Xaa_{18}-Xaa_{19}-R

(SEQ ID NO: 1)

wherein, each of Xaa_1, Xaa_2, and Xaa_{19} is optionally a part of the polypeptide,
wherein, when Xaa_1 is a part of the polypeptide, Xaa_2 is part of the polypeptide,
wherein each of Xaa_3, Xaa_5, Xaa_9, Xaa_{12}, and Xaa_{14} is an amino acid selected from the group consisting of Tyr, Phe, and Trp,
wherein each of Xaa_1, Xaa_2, Xaa_6, Xaa_7, Xaa_{10}, Xaa_{15}, Xaa_{16}, Xaa_{18}, and Xaa_{19} is an amino acid selected from the group consisting of Arg and Lys,
wherein R is –OH or -NH_2, and
wherein Cys_4 is optionally disulfide bonded to Cys_{17} and Cys_8 is optionally disulfide bonded to Cys_{13}.

37. The method of claim 36, wherein the polypeptide is T22:

Arg-Arg Trp-Cys-Tyr-Arg-Lys-Cys-Tyr-Lys-Gly-Tyr-Cys-Tyr-Arg-Lys-Cys-Arg

(T22; SEQ ID NO: 2).

38. The method of claim 36, wherein the tumor cell is a breast cancer cell, a breast tumor cell, a lymphoma cell, a neuroblastoma cell, a lung cancer cell, an angiosarcoma cell, a pancreatic cancer, a leukemia cell, or a prostate cancer cell.

39. The method of claim 36, wherein the tumor cell is a melanoma cell.